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中药贝母的基原植物和药用亲缘学的研究

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The botanical origin and pharmacophylogenetic treatment of Chinese materia medica Beimu

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Abstract Beimu, one of the most commonly used Chinese Materia Medica (CMM), is derived from the bulbs of some fritillaries. In recent years, a large number of new species and infraspecific taxa of the genus *Fritillaria* have been described from China, with total number of taxa of 80 species, 52 varieties, and 6 forms. The dramatic increase of new taxa of the Chinese fritillaries has influenced the investigation, application, quality control and commodities circulation of the CMM “Beimu”. We undertook a comprehensive study of the morphological, geographical, phytochemical and historical aspects of Chinese medicinal fritillaries, as well as their current application. We treated the source plants of “Beimu” from a pharmacophylogenetic point of view as the following six groups. (l) Zhebeimu (浙贝母) is a general name of bulbs mainly derived from the cultivated *Fritillaria thunbergii* in Zhejiang and Jiangsu provinces. It contains D/E *trans* cevanine group alkaloids, predominantly verticine, isoverticine, and verticinone. No D/E *cis* cevanine group alkaloids were detected. (2) Yibeimu (伊贝母) consists of *F. walujewii* and *F. pallidiflora*, which are distributed in Xingjiang Uygur Autonomous Region. Unlike Zhebeimu, Yibeimu contains D/E *cis* cevanine group alkaloids, of which imperaline is representative; no D/E *trans* form of cevanine group alkaloids has so far been found. (3) Pingbeimu (平贝母) is obtained from cultivated *F. ussuriensis* in northeastern China. It contains both D/E *trans* and *cis* forms of cevanine group alkaloids. (4) Chuanbeimu (川贝母) is the most important medicinally used Beimu; it is derived mainly from *F. cirrhosa*, *F. przewalskii*, and *F. unibracteata* in the Hengduan mountains and their adjacent regions. These three species all have smaller bulbs than the other species and are the main source of “Qingbei” (青贝), a kind of Beimu of the highest quality. *Fritillaria cirrhosa*, distributed in Xizang, Yunnan, Sichuan, and Qinghai, shows many morphological variations, and towards its northwestern limit is replaced by a very closely related species, *F. taipaiensis*. In addition, the bulbs of *F. delavayi*, called Lubei (炉贝), are

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also in the group of Chuanbeimu. All kinds of Chuanbeimu contain both D/E *trans* and D/E *cis* cevanine group alkaloids. (5) Hubei Beimu (湖北贝母) is obtained mainly from bulbs of cultivated *F. hupehensis*, which is very closely related to *F. monantha*. It contains both D/E *trans* and *cis* forms of cevanine group alkaloids; verticine and isoverticine are representative of the D/E *trans* form, and hupehenine, hupeheninoside, hupehenrine, and hupehenizine are representative of the D/E *cis* form. (6) Anhui Beimu (安徽贝母) is derived from *F. anhuiensis* and contains only D/E *trans* cevanine group alkaloids. The six groups of fritillaries have six “Dao-di” (genuine) localities of origin. This is in accordance with current application and marketing. All except Anhui Beimu are recorded in the latest edition of *Pharmacopoeia of the People's Republic of China* (2005 ed., Vol. 1). As a result of this study, we advocate that the publication and naming of new taxa of the most important economic plants should be more prudent.

Key words *Fritillaria*, botanical origin, pharmacophylogenetic study, Chinese materia medica Beimu.

摘要 贝母是一种常用中药，有十分悠久的药用历史。百合科Liliaceae中的贝母属*Fritillaria*是中药贝母的主要来源，此属全世界约有130种，我国由于近年来发表了大量的新种和新变种，使国产贝母属的种名达到80个，变种名称52个，变型名称6个。大量新分类名称的出现对中药贝母的质量控制和应用方面造成一定困难。通过对中药贝母的历史沿革、植物分类、地理分布、化学成分、现今生产及应用等的综合研究整理，将中药贝母划分为6个类型：浙贝母、川贝母、伊贝母、湖北贝母、平贝母和安徽贝母。这样的划分除安徽贝母尚未收载于药典外，其他均与现行版的中华人民共和国药典(2005版)一部所收载的内容一致。通过此项研究，作者建议，凡是主要经济植物的新名称的出现必须更加慎重，而且从实际应用的观点出发，分类群的划分不宜过细。

关键词 贝母属；基原植物；药用植物亲缘学；中药贝母

贝母是一种常用的中药，近年来，多位学者对国产贝母属*Fritillaria* L.植物进行分类研究，发表了众多的新种和新变种，使国产贝母属植物“种”数已达80个，“变种”名称数已达52个。这使得中国贝母属植物的新分类群是原有分类群的几倍(种)至十数倍(变种)之多。这种情况的出现，在对中药贝母的研究、使用、质量控制乃至生产流通等诸多方面增加了困难和混乱。通过中药贝母原植物分类这样的一个实例，反映出在中药、药用植物以及经济植物的范围内，应该怎样正确命名和使用学名这样的一个严肃问题。

通过我们过去对中药贝母的研究，我们愿意和大家讨论这个问题。

1 中药贝母使用的历史沿革

贝母始载于《神农本草经》，列为中品。《本草经集注》释其名，谓根“形似聚贝子，故名贝母。”因而，古代贝母具“聚贝子”形态的，包括了葫芦科Cucurbitaceae的假贝母*Bolbostemma paniculatum* (Maxim.) Franquet (余世春，肖培根，1990a)，如陆玑《诗疏》云：“叶如栝楼而细小，其子在根下如芋子，正白。”《本草图经》中蔓生“贝母”的附图也与之相符。至于百合科Liliaceae贝母属*Fritillaria*植物，唐《新修本草》记载：“四月蒜熟时采，良叶形如大蒜。”。《重修政和经史证类备用本草》中所收的“峡州贝母”亦明显为贝母属植物。自唐代以后，以贝母属植物作为中药贝母正品一直沿用至今。

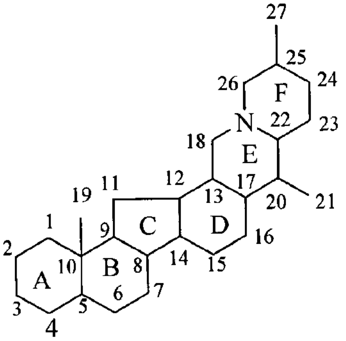
2　贝母属植物中甾体生物碱的分类及其分布

甾体生物碱是中药贝母的主要活性成分, 也是其特征性成分之一, 具有分类学意义。

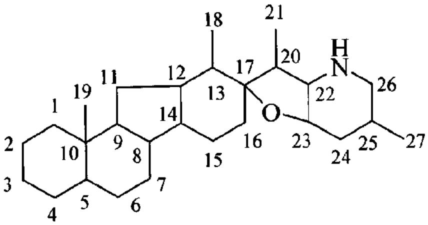
2.1　分类

贝母中的甾体生物碱按其结构类型可分为两大类: 异甾体类和甾体类。异甾体类生物碱根据其杂环的结构类型又可分成瑟文型(cevanine group)、介黎芦型(jervine group)和黎芦胺型(veratramine group); 甾体类生物碱则主要为茄碱型(solanidine group)和裂环茄碱型(secosolanidine group)(图1)。贝母中分出的甾体生物碱绝大多数为瑟文型(占所分离甾体生物碱的80%以上), 其顺反构型见图2。

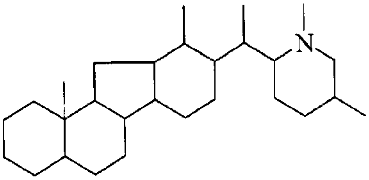
(1)异甾体类生物碱(isosteroidal alkaloids)



瑟文型
Cevanine group
（I）

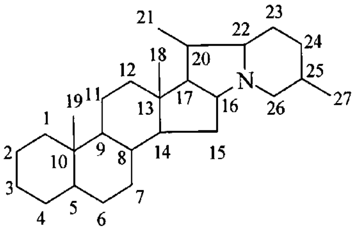


介黎芦型
Jervine group
（II）

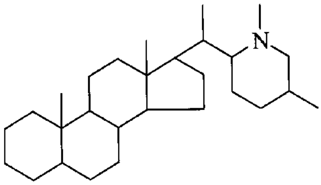


黎芦胺型
Veratramine group
（III）

(2)甾体类生物碱(steroidal alkaloids)



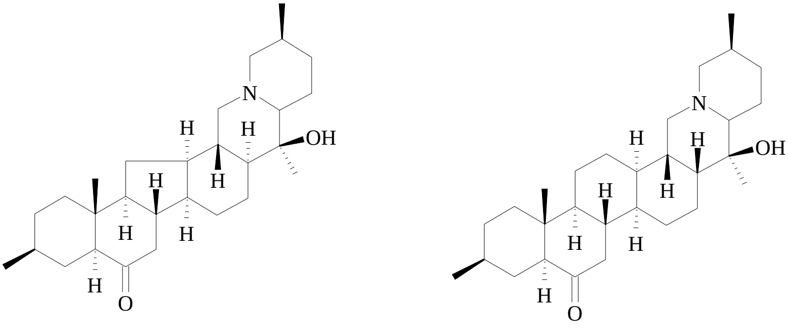
茄碱型
Solanidine group （IV）



裂环茄碱型
Secosolanidine group （V）

图**1**　贝母中甾体生物碱的类型

Fig. 1.　Types of steroidal alkaloids in *Fritillaria.*



浙贝乙素 AI. D/E反式
Verticine, Peimine AI. D/E *trans*

西贝素 AII. D/E顺式
Imperialine AII. D/E *cis*

图**2** 瑟文型甾体生物碱顺反构型
Fig. 2. D/E configuration of cevanine group steroidal alkaloids.

2.2 分布

迄今为止，已先后从29类贝母属植物中分离鉴定出120多个生物碱(表1)。

2.3 含量

由于贝母甾体生物碱大都没有共轭体系，其单体生物碱的含量测定一直受到限制。随着分析技术的不断发展，尤其是蒸发光散射检测器(ELSD)的出现，使得单体生物碱的分析变得简单而准确。李松林等(1999a, b, 2000, 2001)分别采用柱前衍生化气相色谱法、直接气相色谱法及HPLC-ELSD法测定了几种主要甾体生物碱在各种贝母中的含量，列于表2。

3 中药贝母的基原植物及药用亲缘学的研究

贝母属是狭义百合科中的一个大属，分布于北半球的温带地区，尤以地中海北岸、伊朗、土耳其等地区分布的种类最为丰富。全属分为5组，中药贝母的基原植物主要来源于贝母组，在长期应用实践中，迄今已形成6个大的主要产区，也即是中医所称的道地产区：伊贝母(又称新疆贝母)、平贝母、川贝母、湖北贝母、浙贝及皖贝(安徽贝母)，兹分别叙述如下：

3.1 伊贝母(新疆贝母)

伊贝母产区主要在新疆，其基原植物主要由2个栽培及产量大的伊贝母和新疆贝母组成。伊贝母在新疆具有较长的栽培历史，并曾被引种到其他贝母产区，如陕西太白县、湖北五峰县等地。该种以其叶宽大，多互生，叶和苞叶先端不卷曲；花黄色，无方格斑纹，花丝光滑等特征而不同于新疆地区甚至中亚地区的其他贝母属种类。伊贝母在栽培条件下表现出一些变异，如Turrill和Sealy (1980)在Kew的栽培植株中就曾记录了一种花柱柱头裂片长达9 mm、最下叶对生的植株。段咸珍和郑秀菊(1987)发现该种花颜色在不同开放时期表现出一定的变化规律，在开放初期花为黄色，中期花被片出现红色斑块，花被片将萎谢时呈蓝色。此外，该种的叶片形状也不是十分稳定，如椭圆形叶在栽培后可以变成披针形叶。新疆贝母具有产量高、经济效益好的特点(段咸珍，郑秀菊，1987)。该种以

表**1** 贝母中甾体生物碱的分布

Table 1 Distribution of steroidal alkaloids in *Fritillaria*

分类群1) Taxon1)	甾体生物碱 Steroidal alkaloids	类型2) Type2)	参考文献 Reference
浙贝母类 **Zhebeimu**			
1 浙贝母[*] *F. thunbergii* Miq.[*]	vrticine	AI	Zhang et al. (1991a)
	verticine N-oxide	AI	Kitajima et al. (1981)
	verticinoside	AI	Morimato & Kimata (1960)
	verticinone	AI	Zhang et al. (1991a)
	verticinone N-oxide	AI	Kitajima et al. (1981)
	isoverticine	AI	Kaneko et al. (1979)
	baimonidine	AI	Kaneko et al. (1979)
	isobaimonidine	AI	Kaneko et al. (1979)
	ebeidinone	AI	Li et al. (2001)
	fritillarizine	AI	Kaneko et al.(1980)
	6β-epi-petilinine	AI	Kaneko (1980)
	zhebeinine	AI	Zhang et al. (1991a)
	zhebeininoside	AI	Zhang et al. (1993a)
	zhebeirine	AI	Zhang et al. (1991b)
	zhebeinone	AI	Zhang et al. (1992)
	peimisine	B	Li et al. (2001)
	sonalinine	E	Yan et al. (1994)
2 东贝母 *F. thunberg*ii var. *chekiangensis* Hsiao & K. C. Hsia	verticine	AI	Zhang et al. (1993b)
	verticinone	AI	Zhang et al. (1993b)
	isoverticine	AI	Zhang et al. (1993b)
	verticinedinone	AI	Zhang et al. (1993b)
	ebeidinone	AI	Li et al. (2001)
	dongbeinine	AI	Zhang et al. (1993c)
	dongbeirine	AI	Zhang et al. (1993c)
川贝母类 **Chuanbeimu**			
3 川贝母[*] *F. cirrhosa* D. Don[*]	verticine	AI	Li et al. (2001)
	verticinone	AI	Li et al. (2001)
	isoverticine	AI	Li et al. (2001)
	ebeiedine	AI	Li et al. (2000)
	ebeidinone	AI	Li et al. (2000)
	ebeienine	AIII	Li et al. (2000)
	imperialine	AII	Kaneko et al. (1986)
	peimisine	B	Li et al. (2001)
4 暗紫贝母[*] *F. unibracteata* Hsiao & K. C. Hsia[*]	verticine	AI	Li et al. (1999a)
	verticinone	AI	Li et al. (1999a)
	ebeidinone	AI	Li et al. (1999a)
	imperialine	AII	Li et al. (1999a)
	songbeinine	AII	Yu & Xiao (1990b)
	songbeinone	AII	Yu et al. (1992)
	songbeisine	B	Yu & Xiao (1990c)
5 梭砂贝母[*] *F. delavayi* Franch.[*]	verticine	AI	Li et al. (1999a)
	verticinone	AI	Li et al. (1999a)
	ebeidinone	AI	Li et al. (1999a)
	delafrinone	AI	Kaneko et al. (1988)
	delafrine	AI	Kaneko et al. (1988)
	imperialine	AII	Kaneko et al. (1985)
	delavine	AII	Kaneko et al. (1985)
	delavinone	AII	Kaneko et al. (1985)
	chuanbeinone	AII	Kaneko et al. (1986)
	peimisine	B	Yu et al. (2005)
	glyco moiety solanidanine	E	Kaneko et al. (1988)
	peimisine	B	Yu et al. (2005)
6 甘肃贝母[*] *F. przewalskii* Maxim. ex Batal.[*]	verticine	AI	Li et al. (1999a)

表**1** (续) **Table 1** (continued)

分类群1) Taxon1)	甾体生物碱 Steroidal alkaloids	类型2) Type2)	参考文献 Reference
7 绿黄贝母 *F. cirrhosa* D. Don var. *viridiflava* S. C. Chen	verticinone	AI	Li et al. (1999a)
	ebeiedine	AI	Li et al. (1999a)
	ebeidinone	AI	Li et al. (1999a)
	imperialine	B	Li et al. (1999a)
8 太白贝母 *F. taipaiensis* P. Y. Li	verticinone	AI	Feng et al. (1994)
	isoverticine	AI	Feng et al. (1994)
	imperialine	AII	Feng et al. (1994)
	chuanbeinone	AII	Feng et al. (1994)
	peimisine	B	Feng et al. (1994)
9 宁夏贝母 *F. taipaiensis* var. *ningxiaensis* Y. K. Yang & J. K. Wu	verticinone	AI	Hu et al. (1993)
	isoverticine	AI	Hu et al. (1993)
	imperialine	AII	Hu et al. (1993)
	chuanbeinone	AII	Hu et al. (1993)
	taipainine	AII	Hu et al. (1993)
	peimisine	B	Hu et al. (1993)
鄂贝母(湖北贝母)类 **Hubei Beimu**			
10 湖北贝母* *F. hupehensis* Hsiao & K. C. Hsia*	verticine	AI	Wu (1982)
	isoverticine	AI	Li et al. (2001)
	verticinone	AI	Wu (1982)
	hupehenine	AII	Wu (1982)
	hupeheninoside	AII	Wu & Wang (1989)
	hupehenizine	AII	Wu & Wang (1989)
	hupehenirine	AII	Wu & Wang (1989)
	ebeiedine	AI	Li et al. (2001)
	ebeidinone	AI	Li et al. (2001)
	hupehemonoside	AII	Wu et al. (1991a)
	peimisine	B	Li et al. (2001)
	hupehenisine	B	Wu et al. (1986)
	ebeisine	B	Wu et al. (1991a)
	hupehenidine	A#	Wu & Pu (1989)
	hupehenine	AI	Wu et al. (1993)
11 优异贝母 *F. egregia* Y. K. Yang, J. Z. Wu & D. T.	hupeheninoside	AI	Wu et al. (1993)
	hupehenizine	AI	Wu et al. (1993)
	hupehenirine	AI	Wu et al. (1993)
12 天目贝母 *F. monantha* Migo	verticine	AI	Zhang & Fan (1994)
	verticinone	AI	Zhang & Fan (1994)
	hupehenine	AI	Zhang & Fan (1994)
	peimisine	B	Zhang & Fan (1994)
皖贝母(安徽贝母)类 **Anhui Beimu**			
13 安徽贝母 *F. anhuiensis* S. C. Chen & S. F. Yin	verticinone	AI	Li & Wu (1986)
	isoverticine	AI	Li & Wu (1986)
	ebeiedine	AI	Li et al. (1999a)
	ebeidinone	AI	Li et al. (1999a)
	wanpeinine	AI	Li & Wu (1986)
	peimisine	B	Li & Wu (1986)
14 鄂北贝母 *F. ebeiensis* G. D. Yu & G. Q. Ji	verticine	AI	Yu & Xiao (1992a)
	verticinone	AI	Yu & Xiao (1992a)
	ebeiedine	AI	Li et al. (1994)
	ebeidinone	AI	Li et al. (1994)
	ebeisine	B	Wu et al. (1991b)
15 紫花鄂北贝母 *F. ebeiensis* var. *purpurea* G. D. Yu & P. Li	verticine	AI	Wu et al. (1989)
	verticinone	AI	Wu et al. (1989)
	isoverticine	AI	Lee et al. (1988)
	ebeiedine	AI	Lee et al. (1988)
	ebeidinone	AI	Lee et al. (1988)

表**1** (续) **Table 1** (continued)

分类群1) Taxon1)	甾体生物碱 Steroidal alkaloids	类型2) Type2)	参考文献 Reference
	ziebeimine	AIII	Wu et al. (1989)
	ebeienine	AIII	Li et al. (1992)
	peimisine	B	Li et al. (2001)
	ebeietinone	D	Li et al. (1992)
16 午阳贝母 *F. wuyangensis* Z. Y. Gao	verticine	AI	Zhou et al. (1990)
	verticinone	AI	Zhou et al. (1990)
	eduardine	AI	Zhou et al. (1990)
	eduardinine	AI	Zhou et al. (1990)
	isoshinomenine	AI	Zhou et al. (1990)
	shinonomenine	AI	Zhou et al. (1990)
平贝母类 **Pingbeimu**			
17 平贝母* *F. ussuriensis* Maxim.*	verticine	AI	Xu et al. (1982)
	verticinone	AI	Li et al. (1999a)
	pingpeimine	AI	Xu et al. (1982)
	pingpeimine C	AI	Xu et al. (1990a)
	pingpeininoside	AI	Xu et al. (1983a)
	heilonine	AIII	Kitamura et al. (1989a)
	imperialine	AII	Xu et al. (1982)
	imperialine-β-D-glucoside	AII	Xu et al. (1983b)
	pingpeimine B	AII	Xu et al. (1988)
	ussurienine	AIII#	Kitamura et al. (1989b)
	ussuricnone	A#	Kitamura et al. (1989b)
	ussuriedine	A#	Kitamura et al. (1989b)
	ussuriedinone	A#	Kitamura et al. (1989b)
	peimisine	B	Wang et al. (1991)
	pingbeinone	F	Kitamura et al. (1989a)
	pingbeidinoside	D	Xu et al. (1989)
	pingbeinine	D	Xu et al. (1990c)
	pingbeininoside	D	Xu et al. (1990c)
伊贝母(新疆贝母)类 **Yibeimu**			
18 伊贝母* *F. pallidiflora* Schrenk*	imperialine	AII	Xu et al. (1990b)
	imperialine-N-oxide	AII	Xu et al. (1990b)
	imperialine-β-D-glucoside	AII	Xu et al. (1990b)
	yibeinoside A	AII	Xu et al. (1990d)
	yibeinoside B	AII	Xu et al. (1993)
	peimisine	B	Yu & Xiao (1992a)
	yibeisine	B	Xu et al. (1992)
	clyclopamine	B	Xu et al. (1990d)
	cycloposine	B	Xu et al. (1990d)
	yibeinoside C	D	Xu et al. (1994)
19 新疆贝母* *F. walujewii* Regel*	imperialine	AII	Liu et al. (1984)
	sinpeinine	AII	Liu et al. (1984)
20 托里贝母 *F. tortifolia* X. Z. Duan & X. J. Zheng	peimisine	B	Li et al. (2001)
	tortifoline	AII	Kitamura et al. (1989c)
21 裕民贝母 *F. yuminensis* X. Z. Duan	imperialine	AII	Zhang et al. (1993d)
	delavinone	AII	Zhang et al. (1993d)
	yubeinine	AII	Zhang et al. (1993d)
	yubeiside	AII	Zhang et al. (1993d)
22 砂贝母 *F. karelinii* (Fisch. ex D. Don) Bak.	verticinone	AI	Min et al. (1986)
	harepermine	AII	Min et al. (1986)
	hareperminoside	AII	Min et al. (1986)
其他贝母类 **Other groups of Beimu**			
23 蒲圻贝母 *F. puqiensis* G. D. Yu & G. Y. Chen	puqiedinone	AI	Lin et al. (1995)
	puqienine A	C	Jiang et al. (2005)

表**1** (续) **Table 1** (continued)

分类群$^{1)}$ Taxon$^{1)}$	甾体生物碱 Steroidal alkaloids	类型$^{2)}$ Type$^{2)}$	参考文献 Reference
	puqienine B	C	Jiang et al. (2005)
	puqietinone	D	Li et al. (1990)
	puqietinonoside	D	Jiang et al. (2005)
	N-demethylpuqietinone	D	Jiang et al. (2005)
24 宁国贝母 *F. ningguoensis* S. C. Chen & S. F. Yin	verticine	AI	Li et al. (1988)
	verticinone	AI	Li et al. (1988)
	isoverticine	AI	Li et al. (1988)
	peimisine	B	Li et al. (1988)
	ningpeisine	C	Li et al. (1988)
	ningpeisinoside	C	Li et al. (1991)
25 轮叶贝母 *F. maximowiczii* Freyn	kuroyurinidine	B	Qian & Toshihiro (1995)
	isokuroyurinidine	B	Qian & Toshihiro (1995)
26 瓦布贝母 *F. wabuensis* S. Y. Tang & S. C. Yueh	isoverticine	AI	Wang et al. (1996)
	imperialine	AII	Wang et al. (1996)
	isoverticine -N-oxide	AI	Chen et al. (2004)
	peimisine	B	Wang et al. (1996)
27 大金贝母 *F. dajinensis* S. C. Chen	peimisine	B	Chao & Hu (1993)
28 华西贝母 *F. sichuanica* S. C. Chen	siechunsine	AII	Wang et al. (1992)
29 浓蜜贝母 *F. mellea* S. Y. Tang & S. C. Yueh	peimisine	B	Chao & Hu (1993)

1)* 表示中华人民共和国药典(2005版)收载品种。2)甾体生物碱类型: A. 瑟文型 (AI, D/E反式; AII, D/E顺式; AIII, $\Delta^{13(17)}$; A$^{\#}$, 罕见类型); B, 介藜芦型; C, 藜芦胺型; D, 茄碱型; E, 裂环茄碱型; F, 其他型。

1)*, the species recorded in the 2005 edition of China Pharmacopoeia. 2) types of steroidal alkaloids: A, cevanine group (AI, D/E *trans*; AII, D/E *cis*; AIII, Δ13(17); A#, rare); B, jervine group; C, veratramine group; D, solanidine group; E, secosolanidine group; F. others.

花较大，窄钟状，花被片内面深紫色具白色斑点；全部叶先端卷曲；蒴果成熟时为长圆柱形，长大于宽等特征而不同于其他新疆贝母种类。该种花被片外面颜色变化较大，易与黄花贝母*F．verticillata* Willdenow中的大花类型，以及直花贝母*F．olgae* Vved.相混淆。黄花贝母和直花贝母不是新疆的主流栽培种类，它们的药用价值尚待研究。

3.2 平贝母

主产于我国东北。原植物为平贝母。本种在东北广泛栽培，有一定产量。东北产的另一种贝母——轮叶贝母，属多鳞片组sect．*Liliorhiza* (Kell.) Benth. & Hook. f.。化学研究表明，其鳞茎中几乎不含生物碱，因而不宜作贝母用。植株较高大，叶多轮生或对生；花柱具乳突等是平贝母的主要鉴别特征。

3.3 川贝母

川贝母是中药贝母中药用价值最高的类群，主要分布在横断山区。代表性种类有川贝母、甘肃贝母和暗紫贝母。这3个种不仅在地理分布上有重叠，特别在横断山区中部及北部地区3个种可同时出现，而且生境完全一致，均生长在海拔2800–4700 m的高山灌丛或草地中。它们的鳞茎为商品川贝母中“ 青贝 ”的主要来源，不少地区有栽培。一般来说川贝母的鳞茎较大，直径可达2 cm，在栽培条件下鳞茎可更大，而甘肃贝母和暗紫贝

表**2**　几种主要甾体生物碱在各种贝母中的含量(μg/g)

Table 2　Contents of some main steroidal alkaloids in *Fritillaria* (μg/g)

贝母 *Fritillaria* species	I	II	III	IV	V	VI	VII	VIII	IX	方法 Method
浙贝母*F. thunbergii*	2075.2	329.3	2075.2	nd	nd	87.3*	nd	nd	191.7	HPLC-ELSD
东阳贝母*F. thunbergii* var. *chekiangensis*	253.6		314.5	–	nd	tr	–	nd	–	Pre-GC
川贝母*F. cirrhosa*	139.1	76.7	121.3	nd	46.7*	43.2*	82.8	90.6	105.3	HPLC-ELSD
绿黄贝母*F. cirrhosa* var. *viridiflava*	398.0		197.6	–	64.0	157.4	–	102.1	–	Pre-GC
暗紫贝母*F. unibracteata*	252.0		149.1	–	nd	306.2	–	127.9	–	Pre-GC
梭砂贝母*F. delavayi*	87.8		108.9	–	nd	1271	–	tr	–	Pre-GC
湖北贝母*F. hupehensis*	105.2	195.8	1866.2	tr	tr	tr	nd	nd	601.7	HPLC-ELSD
鄂北贝母*F. ebeiensis*	1650.8		1363.2	–	235.9	224.2	–	nd	–	Pre-GC
紫花鄂北贝母*F. ebeiensis* var. *purpurea*	629.9	1119.2	2385.0	nd	110.2	117.1*	105.0	nd	716.7	HPLC-ELSD
安徽贝母*F. anhuiensis*	174.3		774.6	–	308.3	157.8	–	nd	–	Pre-GC
平贝母*F. ussuriensis*	40.1		tr	–	nd	nd	nd	29.5	–	Pre-GC
伊犁贝母*F. pallidiflora*	nd		nd	–	nd	nd	nd	855.1	–	Pre-GC
新疆贝母*F. walujewii*	nd		nd	nd	nd	nd	–	113.9	185.2	HPLC-ELSD
裕民贝母*F. yuminensis*	nd		nd	–	nd	nd	–	646.4	–	Pre-GC
额敏贝母*F. meleagroides* Patrin ex Schultes & J. H. Schultes	nd		nd	–	nd	nd	–	nd	–	Pre-GC
轮叶贝母*F. maximowiczii*	nd		nd	–	nd	nd	nd	nd	–	Pre-GC

*，仅采用GC法测定; nd，未检测到; tr，痕量; –，未检测。

*, only detected by GC method；nd, not found；tr, trace；–, not detected.

I, Verticine; II, Isoverticine; III, Verticinone; IV, Hupehenine; V, Ebeidine; VI, Ebeiedinone; VII, Ebeienine; VIII, Imperialine; IX, Peimissine.

母的鳞茎较小，直径在1 cm左右，同样，在栽培条件下鳞茎会更大。贝母商品中以鳞茎较小者为上，许多川贝母未开花植株的鳞茎与甘肃贝母和暗紫贝母的鳞茎在大小上无法区分。因此在这3种贝母均有分布的地区，它们是混在一起被采挖和出售的。川贝母的形态特征包括叶先端卷曲与否、叶状苞片的数目、花被片的颜色、斑块的大小和多少、花被片的形状以及雄蕊花丝是否具乳突等特征均表现出较大的变异范围。正因为如此，自1966年开始，国内学者先后发表了36个与川贝母相近的名称(李培元，1966；陈心启，1983；唐心耀，岳松键，1983；陈心启等，1985；杨永康，吴家坤，1985；杨永康等，1987)，形成一个庞大的分类复合群。根据对野外和栽培川贝母形态特征的观察和分析，罗毅波和陈心启(1996b)将该复合群分成4个种。这4个种有不同的地理分布范围，但在形态上没有明显的界限。从这些类群的化学成分来看，来自川贝母复合群的种类也没有差异。因此，我们认为从贝母商品角度来看，可以考虑将川贝母复合群所有种类均作为川贝母来处理。

梭砂贝母是横断山区另外一类比较常见的贝母，主要生长于海拔3800–5600 m的砂石地或流砂岩石缝中。该种主要以叶较少(3–5枚，包括苞叶)，紧密生于植株中下部；宿存花被片直立包被未成熟蒴果直至成熟时才萎蔫，而不同于其他贝母种类。横断山区所产其他贝母属种类，如粗茎贝母*F. crassicaulis* S．C．Chen、中华贝母*F. sinica* S．C．Chen、高山贝母*F. fusca* Turrill、大金贝母和米贝母 *F. davidii* Franch.等由于分布比较狭窄，而没

有成为该地区贝母商品的主流。

3.4 湖北贝母(鄂贝母)

湖北贝母是近年来在长江中下游地区栽培比较广泛的一种贝母。产量很大，其商品量仅次于浙贝。该种与天目贝母在形态上没有明显差异(罗毅波，陈心启, 1995)。考虑到湖北贝母栽培较广，研究深入，并已载入中华人民共和国药典2005版一部中，为避免商品名称的混乱，我们仍使用湖北贝母这个名称。湖北贝母以叶较宽，通常3–7枚轮生，苞片先端卷曲，花梗长1–2 cm以上而不同于天目贝母。值得注意的是蒲圻贝母鳞茎的化学成分十分独特，但形态上却与天目贝母和湖北贝母十分接近，仅在生境方面有一定的差异，前者主要生长在海拔200–400 m的低山地区，而后两者主要分布在海拔1000 m左右的山地。需进一步研究来确定蒲圻贝母的分类地位。蒲圻贝母的栽培范围也有限，其药用价值待研究。

3.5 浙贝母

浙贝母主要生于海拔600 m以下的竹林或稍荫蔽的地方，浙江及其邻近省份栽培也较多，产量极大，居商品贝母的首位。日本也有栽培，有时逸出成为野生状态。浙贝母中有一种植株较矮小，鳞茎较小的类型被称为东贝母。商品东贝母流传较广，使用时间较长。考虑到贝母商品中鳞茎小的商品价值较高，因此我们推测东贝母可能是由于具有较高的商品价值而被人为地从浙贝母中选育出来的品种。

3.6 皖贝母(又称安徽贝母)

皖贝母为近年发展的中药贝母品种。在长江中下游地区与湖北贝母形态相近的贝母种类还有安徽贝母，后者主要以鳞茎由2–3枚大鳞片包着数量不等、大小、形状相异的小鳞片，这种鳞茎结构与多鳞组不同，后者是大鳞片外着生许多小鳞片。安徽贝母作为商品贝母栽培的规模目前还不大。

如表1所示，贝母中含有的甾体生物碱绝大多数为瑟文型异甾体生物碱(占所分离异甾体生物碱的80%以上)，且从表2可以看出对于大多数贝母来说，该类生物碱为主要成分和活性成分之一。因而适宜用来讨论药用亲缘学方面的关系。

如上所述，中药贝母的使用经过了漫长的历史沿革，迄今已形成了川贝母、浙贝母、鄂贝母(湖北贝母)、伊贝母(新疆贝母)、平贝母以及皖贝母(安徽贝母)六个地道产地。对各种贝母的药效评价，如张石顽的《本经逢原》中记述：“贝母，川者味甘最佳，西者味薄次之，象山者微苦又次之。”所述川者即川贝母，质量最好，西者指新疆贝母质量次之，象山者即浙贝母质量又次之。古代本草的这种传统经验记述，与现代科学研究结果基本一致。

浙贝母类以富含verticine及verticinone(即D/E反式瑟文型生物碱)，同时不含有imperialine(D/E顺式瑟文型生物碱)为其特征；伊贝母类则相反，含有较多的imperialine顺式瑟文型生物碱，虽未检测到imperlialine顺式的瑟文型生物碱，但却衍生了含量并不十分高的湖贝甲素(hupehenine)、湖贝甲素苷(hupeheninoside)、湖贝乙素(hupehenirine)、湖贝嗪(hupehenirine)及湖贝苷(hupehemonoside)等一系列D/E顺式的瑟文生物碱，形成了其独特的地位(阮汉利等, 2002)。皖贝类除含有较高量的verticine和verticinone外，还伴随含有较高量的ebeiedine、ebeiedinone等D/E反式瑟文生物碱，但均未检测到D/E顺式的瑟文

生物碱，形成其皖贝母的特色。对平贝母来说，虽均含有D/E反式的verticine和verticinone类生物碱和D/E顺式的imperlialine类生物碱，但含量均不高。

4 讨论及小结

药材原植物来源是保证药材质量最基本的物质基础。为了保证药材用药的正确性，各国药典根据各国用药的具体情况，对各种药材的来源均作了具体的规定。这种规定具有法典上的权威性，同时为了方便应用所规定的学名也需要有相对的稳定性。而另一方面，植物分类和系统植物学的研究，特别是最近分子生物学方面的研究结果，往往会对传统长期习用的植物学名产生等级或归属上的变动，同时还由于不同学者的学术观点经常会出现很大的差异和变动。中国贝母属植物作为中药贝母的主要原植物来源在分类中出现大量新种和新变种便是一个很好的例子。应该说植物的变异和生物多样性是普遍存在的，不同学者的不同观点也是客观存在的。因此，这种矛盾也是不可回避的事实。面对这样的矛盾，各国药学界和药典所采用的原则和传统做法是：不轻易采用文献刚出现的新名称和新等级，在经过一段时间和实践的检验后，对新名称或新等级的采用再由专家进行取舍。

我们这次的研究和整理结果，赞同和支持上述观点。同时我们对贝母属植物化学成分的变化与形态学变化比较后，发现它们之间的关系很复杂。有的化学成分比较一致但形态学的变化较大，如川贝母复合群，在植株形态和花部特征等方面表现出较大的差异，并且这种变化是连续的。从进化生物学角度考虑，川贝母复合群可能是一个比较年轻的并且正处于激烈分化的物种形成阶段；考虑到贝母属化学成分可能由比较复杂的遗传物质调控，因此这种化学成分的相似性是有可能的。也有些化学成分相差较大而形态学变化不大，如湖北贝母和蒲圻贝母。但总的研究结果和中华人民共和国药典2005版一部中收载的川贝母、平贝母、伊贝母、浙贝母和湖北贝母的植物来源(注：皖贝母尚未收载于本版药典中)基本一致。而且与晚近的植物分类文献(罗毅波，陈心启，1995，1996a，b，c；Chen & Mordak, 2000)以及中药文献(肖培根, 2002)较为一致。化学成分和药物亲缘学也基本支持上述结果。

为此，我们建议：对于重要药用植物和重要中药原植物学中物种的确认和命名应该十分慎重，最好要建立在对这些物种的生物学背景有一个深刻认识，并且在形态(morphology)、生化、系统(phylogenetics)、亲缘地理(phylogenetic geography)等多种学科综合研究的基础上再得出结论。

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